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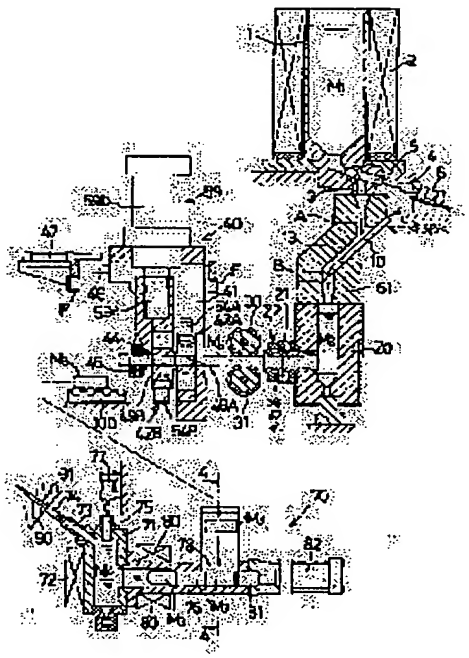
(54) CASTING METHOD, CASTING FACILITY, METHOD FOR PRODUCING METALLIC RAW AND APPARATUS FOR PRODUCING METALLIC RAW

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a casting in which the increases of applying cost and raw material cost are restrained and thixotropy is effectively utilized without needing a complicated control.
SOLUTION: This casting method comprises a first producing process, in which molten magnesium alloy M1 is cooled and metallic slurry M2 containing a solid phase is produced, a second producing process, in which this metallic slurry M2 is further cooled and a solidified metallic blank M3 is produced, and a process, in which this metallic raw M3 is heated till becoming semi-molten magnesium alloy M4 and this semi-molten magnesium alloy M4 is supplied into a metallic mold 90.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The casting approach characterized by including the 1st generation process which generates the metal slurry which cooled molten metal and included solid phase, the 2nd generation process which generates the metal material which cooled further and solidified said metal slurry, and the process which heats said metal material in the half-melting condition, and supplies this to metal mold.
[Claim 2] Said 2nd generation process is the casting approach including the process which generates a metal material continuously from a metal slurry, and cuts the metal material of a parenthesis to predetermined die length according to claim 1.
[Claim 3] The casting facility characterized by supplying this to metal mold after providing the 1st generation means which generates the metal slurry which cooled molten metal and included solid phase, and the 2nd generation means which generates the metal material which cooled further and solidified said metal slurry and heating said metal material in the half-melting condition.
[Claim 4] Said 2nd generation means is a casting facility [equipped with the cutting unit which generates a metal material continuously from a metal slurry, and cuts the metal material of a parenthesis to predetermined die length] according to claim 3.
[Claim 5] Said cutting unit is a casting facility according to claim 4 which is what cuts the metal material concerned after it is movable and relative velocity with said metal material has become zero along the travelling direction of the metal material generated continuously.
[Claim 6] The manufacture approach of the metal material characterized by including the 1st generation process which generates the metal slurry which was an approach for manufacturing the metal material supplied to metal mold in the condition of having heated in the half-melting condition, cooled molten metal and included solid phase, and the 2nd generation process which cools further and solidifies said metal slurry.
[Claim 7] Said 2nd generation process is the manufacture approach of a metal material including the process which solidifies a metal slurry continuously and cuts this to predetermined die length according to claim 6.
[Claim 8] The manufacturing installation of the metal material characterized by providing the 1st generation means which generates the metal slurry which was equipment for manufacturing the metal material supplied to metal mold in the condition of having heated in the half-melting condition, cooled molten metal and included solid phase, and the 2nd generation means which cools further and solidifies said metal slurry.
[Claim 9] Said 2nd generation means is the manufacturing installation of a metal material [equipped with the cutting unit which solidifies a metal slurry continuously and cuts this to predetermined die length] according to claim 8.
[Claim 10] Said cutting unit is the manufacturing installation of the metal material according to claim 9 which is what cuts the metal material concerned after it is movable and relative velocity with said metal material has become zero along the travelling direction of the metal material generated continuously.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the casting approach which used effectively the thixotropy (thixotropy) of half-melting and a half coagulation metal for the detail more, a casting facility, the manufacture approach of a metal material, and a manufacturing installation about the manufacture approach of the casting approach of the metal containing various alloys and a casting facility, and the metal material further applied with a casting facility or an injection molding machine, and a manufacturing installation.
[0002]
[Description of the Prior Art] As the casting approach using the thixotropy of half-melting and a half coagulation metal, i.e., the property in which viscosity is small excellent in a fluidity, the CHIKUSO cast method (half-melting casting) and the LEO cast method (half-coagulation casting) are learned conventionally. Each of these casting casts using the metal slurry in half-melting and the half coagulation condition that the metal of the liquid phase and the metal of solid phase which were fused are intermingled.
[0003] Among these, the CHIKUSO cast method heats a solid-state metal until it serves as a metal slurry of a half-melting condition, and it supplies this to metal mold. On the other hand, once the LEO cast method fuses a solid-state metal, it cools this molten metal until it serves as a metal slurry in the half-coagulation condition of having a granular crystal, and supplies this to metal mold.
[0004] There is an advantage of ** -- the thinning of ** product which can control generating of ** internal shrinkage and can raise a mechanical strength whose ** yield according to these casting the rate of solid phase is high, whose restoration nature to metal mold improves since casting using the metal of low viscosity is moreover attained, and improves and whose molding of ** large-sized product is attained can be attained. Moreover, in order to also reduce the heat burden to metal mold, the life of metal mold will also be prolonged.
[0005]
[Problem(s) to be Solved by the Invention] By the way, also in which casting mentioned above, in order to use effectively the thixotropy of half-molten metal, and the fluidity of a half-coagulation metal, it needs to be as detailed as possible and it is necessary to have uniform non-dendrite crystal (desirably spherical crystal) moreover in half-melting and the half coagulation metal concerned. However, a solid-state metal is only heated to a half-melting condition, or only by cooling molten metal to a half-coagulation condition, the most serves as dendrite crystal, it will appear in half-melting and a half coagulation metal, and the thixotropy of the half-molten metal concerned and the fluidity of a half-coagulation metal cannot fully be acquired.
[0006] For this reason, many approaches of carrying out sequential heating and making this the metal slurry of a half-melting condition are used, applying the extruder of a screw type generally used with an injection molding machine, and giving shearing force to a solid-state metal into the barrel of the extruder concerned in the CHIKUSO molding method.
[0007] However, since the structure of the extruder of a screw type is complicated and expensive, it becomes very huge [the application cost to a casting facility]. And since the metal slurry generated within the barrel of an extruder will be supplied to metal mold as it is, it cannot check whether the crystallized state serves as desired non-dendrite crystal, either. Furthermore, it is necessary to apply what was fabricated in the shape of a chip as a solid-state metal supplied to a barrel, and raw-material cost will also become very expensive.
[0008] The approach of cooling on the other hand, cooling the metal fused in the holding furnace in the solid-liquid coexistence condition which consists of solid phase and the liquid phase by making a cooling object contact, and holding this in a half-melting temperature region in a maintenance container in the LEO cast method, as shown, for example in JP,10-34307,A, and generating a metal slurry is used.
[0009] Since according to such an approach molten metal will crystallize many crystalline germs in the phase in contact with a cooling object and this will grow spherically into a maintenance container further, a desired metal slurry can be obtained without requiring an expensive extruder like the CHIKUSO cast method. And since what is necessary is just to supply a regulus as it is to a holding furnace, increase of raw-material cost can be suppressed. Furthermore, it is also possible to check easily whether it has desired non-dendrite crystal to the metal slurry generated in the maintenance container, and casting which used the fluidity of a half-coagulation metal effectively is attained.
[0010] However, in order to actually build mass-production organization in the LEO cast method mentioned above, between the cooling object which cools molten metal, and the metal mold with which a metal slurry is supplied, the

process which many maintenance containers are installed [process] and contacts molten metal on a cooling object, and the process which supplies a metal slurry to metal mold must be interlocked using the maintenance container of these large number, and very complicated control is needed. Furthermore, to the metal slurry in each maintenance container, the control which exact temperature management was needed and was mentioned above by the time it supplied metal mold will be complicated further.

[0011] This invention makes it a solution technical problem to offer the casting approach and casting facility which enable casting which used the thixotropy effectively in view of the above-mentioned actual condition, without suppressing increase of application cost, and increase of raw-material cost, and requiring complicated control.

[0012]

[Means for Solving the Problem] In order to solve the technical problem mentioned above, as a result of repeating research wholeheartedly, when the metal slurry which has non-dendrite crystal was cooled quickly, and holding the thixotropy potentially and heating this in the half-melting condition even if it solidified and became a metal material, it checked presenting a thixotropy again for about 1 hour. This invention will solve the technical problem mentioned above using the property which presents a thixotropy again, if it heats in the half-melting condition also after the metal slurry which has such non-dendrite crystal serves as a once solidified metal material.

[0013] That is, he is trying to include the 1st generation process which generates the metal slurry which cooled molten metal and included solid phase by the casting approach concerning this invention, the 2nd generation process which generates the metal material which cooled further and solidified said metal slurry, and the process which heats said metal material in the half-melting condition, and supplies this to metal mold. In this case, it is desirable to constitute so that the process which the 2nd generation process generates a metal material continuously from a metal slurry, and cuts the metal material of a parenthesis to predetermined die length may be included.

[0014] Moreover, after providing the 1st generation means which generates the metal slurry which cooled molten metal and included solid phase, and the 2nd generation means which generates the metal material which cooled further and solidified said metal slurry and heating said metal material in the half-melting condition, he is trying to supply this to metal mold in the casting facility concerning this invention. In this case, it is desirable to have the cutting unit which the 2nd generation means generates a metal material continuously from a metal slurry, and cuts the metal material of a parenthesis to predetermined die length, it is movable along the travelling direction of the metal material with which the cutting unit was generated further continuously, and it is desirable that it is what cuts the metal material concerned after relative velocity with said metal material has become zero.

[0015] Moreover, he is an approach for manufacturing the metal material supplied to metal mold in the condition of having heated in the half-melting condition by the manufacture approach of the metal material concerning this invention, and is trying to include the 1st generation process which generates the metal slurry which cooled molten metal and included solid phase, and the 2nd generation process which cools further and solidifies said metal slurry. In this case, it is desirable that the 2nd generation process includes the process which solidifies a metal slurry continuously and cuts this to predetermined die length.

[0016] He is equipment for manufacturing the metal material supplied to metal mold in the condition of having heated in the half-melting condition, at the manufacturing installation of the metal material furthermore applied to this invention, and is trying to provide the 1st generation means which generates the metal slurry which cooled molten metal and included solid phase, and the 2nd generation means which cools further and solidifies said metal slurry. In this case, it is desirable that the 2nd generation means is equipped with the cutting unit which solidifies a metal slurry continuously and cuts this to predetermined die length, it is movable along the travelling direction of the metal material with which the cutting unit was generated continuously, and it is still more desirable that it is what cuts the metal material concerned after relative velocity with said metal material has become zero.

[0017]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail based on the drawing in which the gestalt of operation is shown. Drawing 1 shows 1 operation gestalt of the casting facility concerning this invention. Especially the casting facility illustrated here is for casting a desired product by making into a raw material the Magnesium alloy represented by AZ91D, and is equipped with the melting basin 1.

[0018] The melting basin 1 has covered that perimeter at the melting heating heater 2, and is for holding in the condition which fused the Magnesium alloy mentioned above by the drive of this melting heating heater 2, i.e., a liquid phase temperature condition. The tapping path 3 is established in that maximum pars basilaris ossis occipitalis at this melting basin 1. The tapping path 3 is for beginning to pour out caudad the melting Magnesium alloy stored in the melting basin 1, was crooked in the shape of an abbreviation crank, and equips the middle with the change-over bulb 4. The valve plunger 5 arranged possible [an attitude] in order to open and close the tapping path 3, and the bulb cylinder 6 which carries out attitude migration of this valve plunger 5 constitute the change-over bulb 4.

[0019] The refrigeration unit 10 is arranged in the lower part region of this melting basin 1 as 1st generation means. A refrigeration unit 10 has and constitutes the circulation path 12 of cooling water in the interior while having two or more guide rails 11 on a front face, as shown in drawing 2 (a) and (b). Inclination arrangement of this refrigeration unit 10 has been carried out in the condition of having made the guide rail 11 countering lower limit opening of the tapping path 3. In addition, the sign 13 in drawing 1 is a covering block arranged so that it may be open for free passage to lower limit opening of the tapping path 3, and predetermined spacing may be secured between the front faces of a refrigeration unit 10 and this may be covered.

[0020] Moreover, a depot 20, the delivery rollers 30 and 31 of a pair, and the cutting unit 40 are formed in the

above-mentioned casting facility as 2nd generation means.
[0021] A depot 20 is a tub which carried out opening to the top face, and is arranged in the lower limit lower part region of a refrigeration unit 10. The material shaping path 21 where the cross section is circular is established in this depot 20. The material shaping path 21 extends horizontally from the lower part section of a depot 20, carries out opening to a side attachment wall, and equips the open end with the quenching unit 22. The quenching unit 22 has and constitutes the annular jacket 23 which surrounds the perimeter perimeter of the material shaping path 21, and the injection tip 24 which carried out opening towards the axial center of the material shaping path 21 from this annular jacket 23, as shown in drawing 3 (a).
[0022] The delivery rollers 30 and 31 of a pair are installed up and down in the condition of having made the mutual peripheral surface countering. Each delivery rollers 30 and 31 have the feeding slots 30a and 31a of the radius of curvature which becomes almost the same as that of the bore of the material shaping path 21 mentioned above to each peripheral surface, and while it is mutual, spacing is secured so that the distance between these feeding slots 30a and 31a may agree with the bore of the material shaping path 21 concerned. Although not clearly shown in drawing, the rotation actuator is coordinated with each delivery rollers 30 and 31, and while the delivery roller 30 located up rotates clockwise in drawing 3 (a), the delivery roller 31 located caudad rotates counterclockwise in drawing 3 (a).
[0023] The cutting unit 40 is equipped with the unit body 41, fixed clamper 42A and movable clamper 42B, and the discharge rollers 44 and 45 of a pair as shown in drawing 1 .
[0024] It is possible to carry out both-way migration horizontally along the direction of an axial center of the material shaping path 21 concerned on the extended region of the material shaping path 21 which the guide rod 46 was made to have supported the unit body 41 movable, and was mentioned above. The retract cylinder 47 is made to be placed between these unit bodies 41 between the fixed frames F. When external force acts on the unit body 41 in the direction which isolates this from a depot 20, while the retract cylinder 47 permits migration of this unit body 41, when expanding actuation is carried out, it is an actuator for returning the unit body 41 to the location close to a depot 20.
[0025] Fixed clamper 42A and movable clamper 42B are letter members of a block which have the clamp through tubes 49A and 49B wide opened by Slits 48A and 48B, respectively, as shown in drawing 3 (b). Each clamp through tubes 49A and 49B have a slightly big bore, and consist of material shaping paths 21 mentioned above. Slits 48A and 48B are formed along the field containing the axial center of the clamp through tubes 49A and 49B, and have the function to expand and contract the bore of the clamp through tubes 49A and 49B, by changing the width of face suitably. While having formed the taper-like inclined planes 50A and 50B in each open end, the rod through tubes 51A and 51B of a pair are made for each slits 48A and 48B to have intersected the location used as each pars intermedia. The taper-like inclined planes 50A and 50B are inclination parts to which width of face becomes large gradually towards the method of outside. It has installed so that it may become parallel mutually, and the rod through tubes 51A and 51B have the semi-sphere-like crevices 52A and 52B in each both-ends opening.
[0026] The clamp oil hydraulic cylinders 53A and 53B and the unclamping oil hydraulic cylinders 54A and 54B of a pair are prepared in these clampers 42A and 42B, respectively.
[0027] the clamp oil hydraulic cylinders 53A and 53B are fitted in the rod through tubes 51A and 51B which mentioned above each piston rod 53aA and 53aB through the clamp piece 55 — making — further — each — it is made to have held to each clampers 42A and 42B by equipping the protrusion edge of piston rod 53aA and 53aB with the clamp piece 56, respectively The part which counters the crevices 52A and 52B of the rod through tubes 51A and 51B the clamp pieces 55 and 56 It is the piece member which presents the shape of a ball of the radius corresponding to the crevices 52A and 52B concerned. When clamp oil pressure acts on the clamp oil hydraulic cylinders 53A and 53B, it functions as narrowing the slits 48A and 48B of each clampers 42A and 42B, that is, reducing the diameter of the clamp through tubes 49A and 49B through Crevices 52A and 52B.
[0028] The unclamping oil hydraulic cylinders 54A and 54B make the point of piston rod 54aA and 54aB have held to each clampers 42A and 42B through a holding bracket 57 in the condition of having made the open end of Slits 48A and 48B countering. The rod 58 for extension is made to have intervened, respectively between piston rod 54aA of each unclamping oil hydraulic cylinders 54A and 54B, 54aB, and the taper-like inclined planes 50A and 50B of Slits 48A and 48B. The rod 58 for extension is the cylindrical member which contacted the taper-like inclined planes 50A and 50B, and when unclamping oil pressure acts on the unclamping oil hydraulic cylinders 54A and 54B, it functions as extending the slits 48A and 48B of each clampers 42A and 42B, that is, expanding the diameter of the clamp through tubes 49A and 49B through the taper-like inclined planes 50A and 50B.
[0029] Fixed clamper 42A with the above configurations is fixed to the unit body 41 mentioned above in the condition that make the axial center of clamp through tube 49A agree in the axial center of the material shaping path 21, and slit 48A meets the vertical upper part.
[0030] On the other hand, slit 48B makes movable clamper 42B have held in the cutting cylinder 59 along with a vertical lower part in the condition of having made the edge which faces to a depot 20 contacting fixed clamper 42A.

[0031] The cutting cylinder 59 is attached in the above-mentioned unit body 41 through cylinder-body 59b, where piston rod 59a is turned to a vertical lower part, and it has the function to which movable clamper 42B is moved along the direction of a vertical to fixed clamper 42A. When this cutting cylinder 59 carries out degeneration actuation most, it will stop in the location where movable clamper 42B went up most, and will be in the condition, i.e., the condition that clamp through tube 49B agrees with clamp through tube 49of fixed clamper 42A A, that the

axial center of that clamp through tube 49B agrees in the axial center of the material shaping path 21. On the other hand, when the cutting cylinder 59 carries out expanding actuation most, movable clamper 42B will descend most and it will stop in the location where the clamp through tube 49B shifted from clamp through tube 49of fixed clamper 42A A completely.

[0032] The discharge rollers 44 and 45 of a pair are in the condition which the mutual peripheral surface was made to counter, and are installed in the roller bracket 60 which extends from movable clamper 42B mentioned above side by side up and down. Each discharge rollers 44 and 45 have the discharge feeding slots 44a and 45a of the radius of curvature which becomes almost the same as that of the bore of the material shaping path 21 mentioned above to each peripheral surface, and while it is mutual, spacing is secured so that the distance between these discharge feeding slots 44a and 45a may agree with the bore of the material shaping path 21 concerned. Although not clearly shown in drawing, the rotation actuator is coordinated with each discharge rollers 44 and 45, and while the discharge roller 44 located up rotates clockwise in drawing 3 (a), the discharge roller 45 located caudad rotates counterclockwise in drawing 3 (a).

[0033] In addition, the sign 61 in drawing 1 is guide block which between the covering block 13 and depots 20 is made to follow.

[0034] Furthermore, as shown in the above-mentioned casting facility at drawing 1 , injection equipment 70 is provided. Injection equipment 70 is for supplying the metal heated in the half-melting condition to metal mold 90, and is equipped with the heating chamber 71. It is airtight ** mostly and the delivery 73 whose heating chamber 71 covered the perimeter at the heating heater 72 and which was established in the upper limit section is connected to the teeming opening 91 of metal mold 90 through the auxiliary nozzle 74.

[0035] The suction rod 75 and the preheating barrel 76 are formed in this heating chamber 71.

[0036] The suction rod 75 is the cylindrical member arranged in the upper limit wall of the heating chamber 71 movable. It has connected with the suction cylinder 77 and attitude migration of this suction rod 75 comes to be carried out by actuation of this suction cylinder 77 to the interior of the heating chamber 71.

[0037] The preheating barrel 76 is the cylindrical member which met horizontally and extended from the side attachment wall of the heating chamber 71. This preheating barrel 76 is constituted so that the bore of the end face part close to the heating chamber 71 may turn into a large diameter from this, while it has the almost same bore as the material shaping path 21 of the depot 20 which the amount of that point mentioned above, and between these is continuing by the taper bore section. As shown in drawing 4 , while having formed the opening 78 for an injection in that upper part at the point of the preheating barrel 76, the chute plates 79 are formed successively to this opening 78 for an injection.

[0038] Moreover, while having formed the preheating heater 80 in that end face section periphery at this preheating barrel 76, the plunger 81 is formed in that point.

[0039] The preheating heater 80 is provided so that the perimeter of the preheating barrel 76 may be surrounded. This preheating heater 80 is set as whenever [a little stoving temperature / lower than the heating heater 72 of the heating chamber 71 which is for heating the preheating barrel 76 and was mentioned above].

[0040] A plunger 81 is a cylindrical member with the magnitude which fits into the point of the preheating barrel 76. The extrusion cylinder 82 for carrying out attitude migration of the plunger 81 in the interior of the preheating barrel 76 is connected with this plunger 81.

[0041] In the casting facility constituted as mentioned above, while throwing the lump of a Magnesium alloy into a melting basin 1, making the melting heating heater 2 drive first and holding a melting Magnesium alloy to the melting basin 1 concerned, a refrigeration unit 10 is made to circulate through cooling water, and the condition of having supplied cooling water to the quenching unit 22 further will be in a standby condition. In this case, in the cutting unit 40, expanding actuation of the retract cylinder 47 is carried out, and while arranging the unit body 41 in the location close to a depot 20, degeneration actuation of the cutting cylinder 59 is carried out, and it has stopped in the location which rose movable clamper 42B most. Moreover, unclamping oil pressure is made to act on the unclamping oil hydraulic cylinders 54A and 54B, where the clamp oil hydraulic cylinders 53A and 53B are made into tank **, and it has held in the condition that each both sides of fixed clamper 42A and movable clamper 42B expanded the diameter of the clamp through tubes 49A and 49B. Furthermore, the delivery rollers 30 and 31 of a pair rotate each at a fixed rate, and, on the other hand, hold the discharge rollers 44 and 45 in the condition of having stopped each.

[0042] Melting Magnesium alloy M1 which Kaisei of the tapping path 3 was carried out, and it stored in the melting basin 1 when degeneration migration of the bulb cylinder 6 is carried out from the standby condition mentioned above and the valve plunger 5 was retreated It will begin to flow into a refrigeration unit 10 through the tapping path 3 concerned (the arrow head A in drawing 1).

[0043] Melting Magnesium alloy M1 with which a refrigeration unit 10 began to be filled After flowing down the guide rail 11 according to the inclination of a refrigeration unit 10, it will once be stored by the depot 20 (the arrow head B in drawing 1). Melting Magnesium alloy M1 which flows down a refrigeration unit 10 in the meantime Metal slurry M2 which was cooled suitably and crystallized many crystalline nuclei to the interior with the refrigeration unit 10 concerned It becomes, and it grows up spherically, and it is detailed and, moreover, the crystalline nucleus further mentioned above in the depot 20 comes to have a uniform spherical crystal. That is, it is the metal slurry M2, without needing an expensive extruder. Sufficient fluidity can be acquired now and increase of application cost can be remarkably reduced now. And since what is necessary is just to supply a regulus as it is to a melting basin 1, increase of raw-material cost can be suppressed.

[0044] Metal slurry M2 once stored by the depot 20 It is discharged outside one by one through the material shaping

path 21 after that. Metal slurry M2 which passes through the material shaping path 21 in the meantime Metal material M3 of the shape of a cylinder rod completely solidified since it was cooled with the cooling water which passes the annular jacket 23 of the quenching unit 22 and was quickly cooled with the cooling water by which injection supply is further carried out from an injection tip 24 It becomes and will be continuously discharged by the exterior of a depot 20. Metal material M3 solidified completely here Metal slurry M2 which fully has a thixotropy It cools quickly, and generates and the thixotropy concerned is held potentially. This is the metal material M3. Checking easily is possible by observing the crystal structure included in inside.

[0045] Subsequently, metal material M3 discharged from the depot 20 With the delivery rollers 30 and 31 of a pair, the cutting unit 40 is supplied, and sequential penetration of the clamp through tube 49of clamp through tube 49A and movable clamper 42B of fixed clamper 42A B is carried out, and it comes to be further supplied between the discharge roller 44 of a pair, and 45.

[0046] When the rotational frequency of the delivery rollers 30 and 31 mentioned above is continuously monitored in the above-mentioned casting facility in the meantime and this rotational frequency becomes the value set up beforehand, the following procedures are followed and it is the metal material M3. A cutting process is carried out.

[0047] That is, if the rotational frequency of the delivery rollers 30 and 31 becomes the value set up beforehand, the oil pressure made to act on the clamp oil hydraulic cylinders 53A and 53B and the unclamping oil hydraulic cylinders 54A and 54B will be switched suitably first, and each both sides of fixed clamper 42A and movable clamper 42B will hold in the condition of having reduced the diameter of the clamp through tubes 49A and 49B. Consequently, as shown in drawing 5 (a), it is the metal material M3 by fixed clamper 42A and movable clamper 42B. The unit body 41 is the metal material M3, being clamped and degenerating the retract cylinder 47. By moving along with a guide rod 46, they are these Clampers 42A and 42B and metal materials M3. Relative velocity serves as zero.

[0048] Then, expanding actuation of the cutting cylinder 59 is made to start immediately, and it is made to make movable clamper 42B lower-** one by one to fixed clamper 42A. Consequently, metal material M3 as shown in drawing 5 (b), after passing fixed clamper 42A Metal material M3 before it Shearing force acts in between and it is the metal material M3 bordering on these. Cutting advances.

[0049] If the cutting cylinder 59 carries out expanding actuation most and cutting of the metal material M3 is completed as shown in drawing 5 (c), the oil pressure made to act on clamp oil hydraulic cylinder 53B and unclamping oil hydraulic cylinder 54B only in movable clamper 42B will be switched suitably, and it will hold in the condition that the movable clamper 42B concerned expanded the diameter of clamp through tube 49B. Furthermore, metal material M3 cut when this and coincidence were made to rotate the discharge rollers 44 and 45 It moves to movable clamper 42B, and comes to be discharged on the predetermined conveyance conveyor 100 (refer to drawing 1).

[0050] Cut metal material M3 While stopping rotation of the discharge rollers 44 and 45 as shown in drawing 5 (d) if discharged on the conveyance conveyor 100, the cutting cylinder 59 and fixed clamper 42A are returned to a standby condition, respectively, expanding actuation of the retract cylinder 47 is further carried out from this condition, and the unit body 41 is returned to a standby condition.

[0051] Henceforth, it is the metal material M3 by repeating the actuation mentioned above and performing it. It will be discharged on the sequential conveyance conveyor 100 by the fixed die length defined beforehand.

[0052] It sets at the above cutting processes and the cutting unit 40 is the metal material M3. After relative velocity has become zero, it is the metal material M3 concerned. In order to cut, it is the metal material M3. It becomes possible to cut this continuously, without suspending generation.

[0053] Metal material M3 generated as mentioned above on the other hand As shown in drawing 4 , it is supplied to the interior of the preheating barrel 76 one by one from the opening 78 for an injection through the chute plate 79. In this case, as shown in drawing 6 (a), when the metal material M3 is thrown into the preheating barrel 76, the sequential drive of the preheating heater 80 and the heating heater 72 of the heating chamber 71 is carried out.

[0054] Metal material M3 thrown into the preheating barrel 76 The sequential heating chamber 71 is supplied by both-way migration of a plunger 81, and as shown in drawing 6 (b), it comes to be held in the heating chamber 71 concerned at a half-melting condition.

[0055] Here, according to the above-mentioned casting equipment, it is the metal material M3. Since preheating is carried out at the preheating heater 80 while being in the preheating barrel 76, it is the metal material M3 concerned. When the heating chamber 71 is reached, it becomes possible to change this into a half-melting condition immediately. Moreover, metal material M3 since the bore for the point is almost the same as that of the metal material M3, before being heated by the half-melting condition in the preheating barrel 76 It will be blockaded and there is no possibility that half-melting Magnesium alloy M4 in the heating chamber 71 may flow backwards.

[0056] Magnesium alloy M4 which changed into the half-melting condition as mentioned above at the heating chamber 71 While a plunger 81 will carry out advance migration by expanding actuation of the extrusion cylinder 82 as shown in drawing 6 (c) if only the specified quantity is stored, the suction rod 75 carries out advance migration by expanding actuation of the suction cylinder 77 at the heating chamber 71. Consequently, Magnesium alloy M2 of the half-melting condition stored by the heating chamber 71 Metal mold 90 will come to be supplied through a delivery 73 and the auxiliary nozzle 74, and it will be fabricated by the desired configuration in the metal mold 90 concerned.

[0057] Half-melting Magnesium alloy M4 supplied to metal mold 90 here Metal material M3 which held the thixotropy potentially It heats and a thixotropy is presented again. Therefore, the advantage of ** -- the thinning of a product whose yield casting of which used this thixotropy effectively is attained, that is, whose rate of solid phase is high,

casting using the Magnesium alloy of low viscosity moreover becomes possible, whose restoration nature to metal mold 90 improves, and improves, whose molding of a large-sized product is attained and which can control generating of internal shrinkage and can raise a mechanical strength can be attained — is done so. Moreover, in order to also reduce the heat burden to metal mold 90, the life of metal mold 90 will also be prolonged.

[0058] And according to the above-mentioned casting facility, it is the metal slurry M2. It once solidifies and is the metal material M3. It is the metal material M3 in interlocking between the refrigeration unit 10 which cools molten metal, and injection equipment 70, in order to generate, to heat this in the half-melting condition again and to make it supply metal mold 90 ****. It receives and it is not necessary to carry out exact temperature management. Therefore, complicated control is completely unnecessary and it becomes possible to carry out very easily casting which used the thixotropy effectively. Furthermore, once solidified metal material M3 It is possible to deal with this also as a simple substance, and it is also possible to aim at improvement in the further convenience.

[0059] Half-melting Magnesium alloy M4 to metal mold 90 While the extrusion cylinder 82 carries out degeneration actuation as shown in drawing 6 (d) after supply is completed, the suction cylinder 77 carries out degeneration actuation, and the surface of hot water of the heating chamber 71 comes to fall. Therefore, half-melting Magnesium alloy M4 concerned The situation solidified in a delivery 73 or the auxiliary nozzle 74 does not occur.

[0060] Henceforth, actuation mentioned above can be carried out repeatedly and can mass-produce a desired product now in metal mold 90.

[0061] In addition, although the casting facility for manufacturing a product by making a Magnesium alloy into a raw material is illustrated with the gestalt of operation mentioned above, it is also possible to manufacture the product which made the raw material other metals and alloys, such as aluminum and its alloy.

[0062] Moreover, although handling [the gestalt of operation mentioned above / the metal material concerned] easily since he is trying to prepare the cutting unit for cutting a metal material, it is not necessary to necessarily prepare a cutting unit. In this case, what is necessary is to heat the generated metal material in the half-melting condition as it is, and just to make it supply metal mold. Moreover, the metal material to generate does not necessarily need to have the circular cross section.

[0063]

[Effect of the Invention] Since a regulus can be applied as it is according to this invention, without an expensive extruder being needed like the old CHIKUSO cast method as explained above, increase of application cost and increase of raw-material cost can be suppressed. And operation becomes possible easily about casting which used the thixotropy effectively, without interlocking between the process which generates a metal slurry, and the processes supplied to metal mold, or carrying out exact temperature management to the solidified metal slurry, since the generated metal slurry is once solidified.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing notionally 1 operation gestalt of the casting facility concerning this invention.
[Drawing 2] Drawing of longitudinal section of the 1st generation means which (a) cools molten metal and generates a metal slurry, and (b) are the cross-sectional view.
[Drawing 3] The sectional view of 2nd generation means by which (a) generates a metal material from a metal slurry, and (b) are the 3-3 line expanded sectional views in (a).
[Drawing 4] It is a 4-4 line expanded sectional view in drawing 1 .
[Drawing 5] It is the conceptual diagram showing the cutting process of the metal material by the cutting unit in order.
[Drawing 6] It is the conceptual diagram showing in order the process which supplies a metal material to metal mold.

[Description of Notations]
1 Melting Basin
2 Melting Heating Heater
3 Tapping Path
4 Change-over Bulb
5 Valve Plunger
6 Bulb Cylinder
10 Refrigeration Unit
11 Guide Rail
12 Circulation Path
13 Covering Block
20 Depot
21 Material Shaping Path
22 Quenching Unit
23 Annular Jacket
24 Injection Tip
30 31 Delivery roller
30a, 31a Feeding slot
40 Cutting Unit
41 Unit Body
42A Fixed clamper
42B Movable clamper
44 45 Discharge roller
44a, 45a Discharge feeding slot
46 Guide Rod
47 Retract Cylinder
48A, 48B Slit
49A, 49B Clamp through tube
50A, 50B Taper-like inclined plane
51A, 51B Rod through tube
52A, 52B Crevice
53A, 53B Clamp oil hydraulic cylinder
53aA(s), 53aB Piston rod
54A, 54B Unclamping oil hydraulic cylinder
54aA(s), 54aB Piston rod
55 56 Clamp piece
57 Holding Bracket
58 Rod for Extension
59 Cutting Cylinder
59a Piston rod

59b Cylinder body
60 Roller Bracket
70 Injection Equipment
71 Heating Chamber
72 Heating Heater
73 Delivery
74 Auxiliary Nozzle
75 Suction Rod
76 Preheating Barrel
77 Suction Cylinder
78 Opening for Injection
79 Chute Plate
80 Preheating Heater
81 Plunger
82 Extrusion Cylinder
90 Metal Mold
91 Teeming Opening
100 Conveyance Conveyor
F Fixed frame

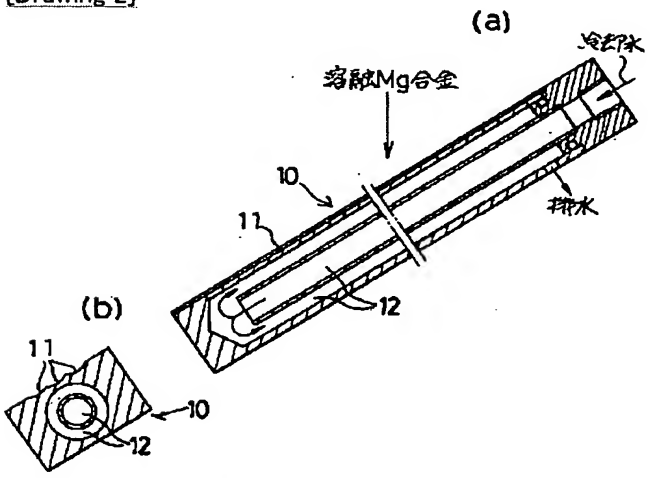
[Translation done.]

* NOTICES *

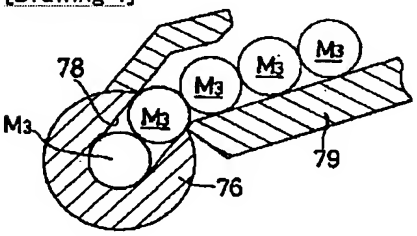
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

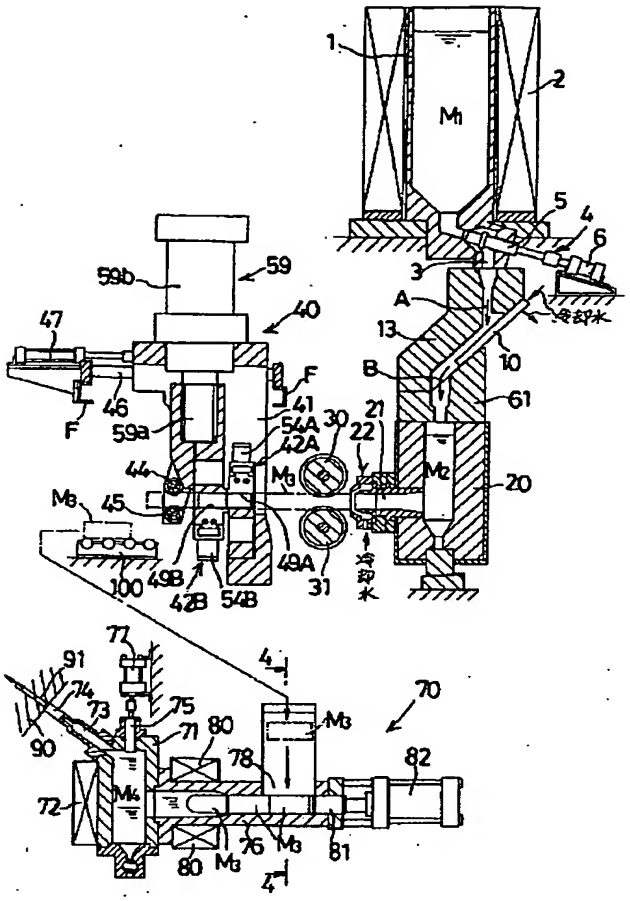
[Drawing 2]



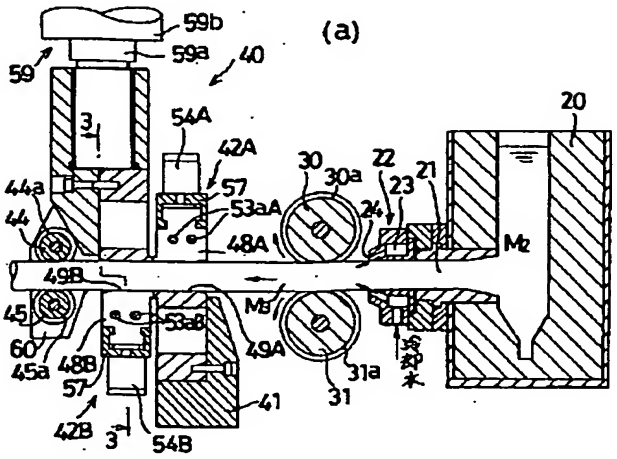
[Drawing 4]

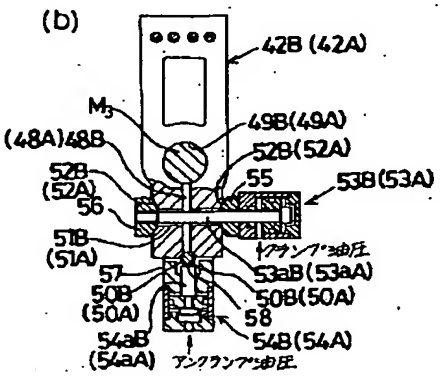


[Drawing 1]

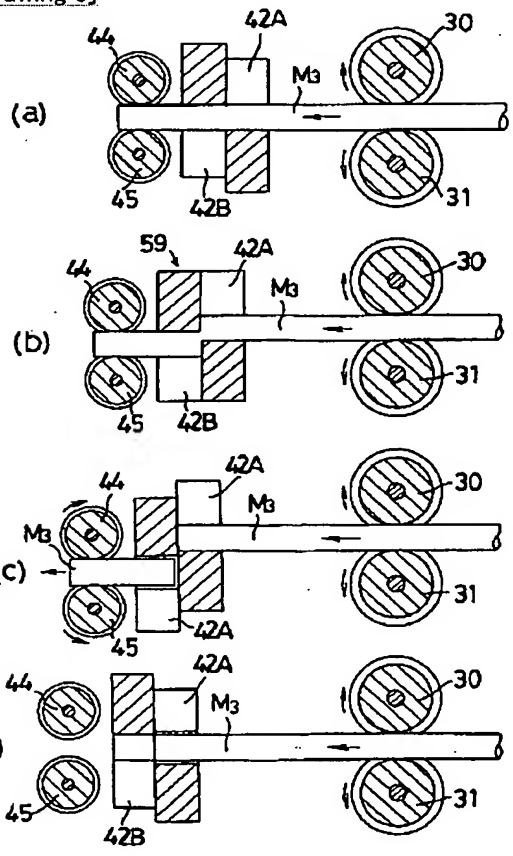

1
2
M1
5
4
6
59b
59
3
A
47
40
13
冷却水
10
B
F
61
46
41
30
21
F
59a
54A
42A
22
44
M3
M2
20
M5
45
49B
49A
100
42B
54B
31
冷却水
77
91
74
73
75
71
80
70
M3
90
78
82
72
M4
76
M3
81
80
M3
4

[Drawing 3]

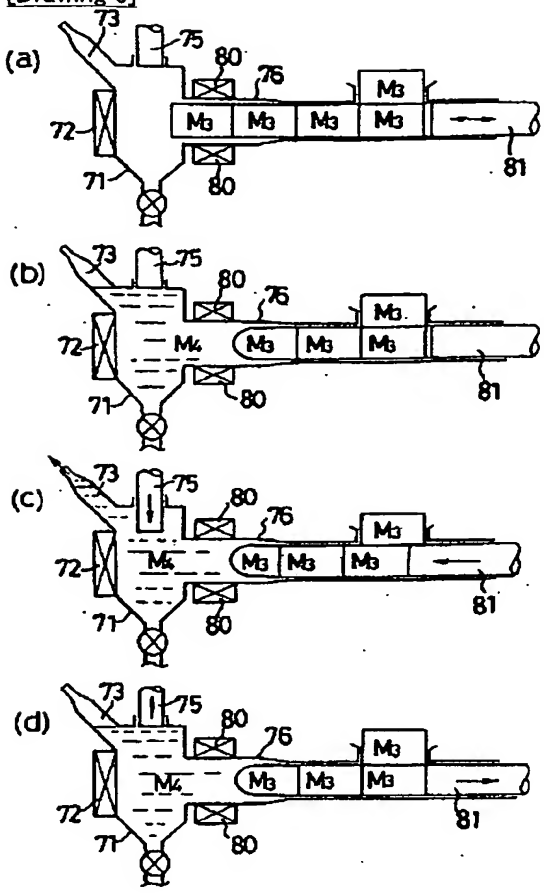

(a)
59b
59a
59
40
20
54A
42A
3
30
30a
22
23
21
44a
44
57
53aA
24
48A
M2
49B
45
M3
53aB
60
49A
45a
48B
31a
57
31
41
42B
3
54B


(b)
42B (42A)
M3
49B(49A)
(48A)48B
52B(52A)
52B
(52A)
55
53B(53A)
56
51B
(51A)
57
53aB(53aA)
50B
(50A)
50B(50A)
58
54aB
(54aA)
54B(54A)

[Drawing 5]


(a)
44
42A
M3
30
45
42B
31
(b)
59
44
42A
M3
30
45
42B
31
(c)
44
42A
M3
30
M3
31
45
42A
(d)
44
42A
M3
30
45
31
42B

[Drawing 6]



[Translation done.]